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Summer 1991 Vol. XXX Issue 2

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Speaking from Topside

It is an honor to start off this issue of the *Navy Civil Engineer* magazine dedicated to the Seabees of the Naval Construction Force. I've spent more than 12 years of my 30-year career with the Seabees, and each one was challenging, exciting and rewarding.

Today's Seabee is very similar to the Seabees we've seen fighting and building with John Wayne in the "Fighting Seabees." They work long and hard hours, they make do with what is on hand, and they're full of pride. But the similarity ends there.

Today the average Seabee is a high school graduate (many with additional college-level courses), and is better equipped, better trained and better suited overall to work anywhere at any time.

Today's Seabee is younger than his or her predecessors of World War II, and has learned the construction trade in the Navy rather than in the private sector.

Today's Seabee is better skilled militarily in the art of defensive tactics, communication, concealment and in the use of firepower. A Seabee battalion today carries enough weaponry to make some infantry commanders green with envy. Today's Seabee is a new breed.

The Seabees' past accomplishments are well-known. In World War II, Seabees constructed hundreds of advanced bases and airfields throughout the Pacific to support the Marines. In Vietnam, they constructed hundreds more logistical bases, airfields and firebases. And they completed one of the largest earthmoving projects in the world—Cubi Point Naval Air Station, where they leveled a mountain to build an airfield.

Today's Seabees have new accomplishments to brag about. We all know of the successful Marine attacks during Operations Desert Shield/Storm. What few of us know is the positive, direct impact and support the Naval Construction Force had on the Marines' successful assault on Kuwait. The NCF, working closely with the Marines, made available 1,600 beds in fleet hospitals. They erected 4,860 tents and Southwest Asia huts for the berthing and administration of 38,000 troops. They built 13 galleys to feed more than 90,000 troops and an enemy prisoner of war compound for 40,000 captured Iraqi soldiers.

The Seabees also moved 2 million cubic yards of fill to site prep airfields for the 7 million square feet of AM-2 matting parking aprons for Marine aircraft. They provided 10 million square yards of storage space for $2 billion of ammunition, 200 miles of maintained roads for main supply routes, 2,000 steel barriers, 500 concrete tank barriers, guard towers and aircraft hangars. The list goes on and on.

Operations Desert Shield/Storm are a new chapter in the history of the Seabees, one we all can be proud of. But it doesn't stop there.

Saudi Arabia isn't the only place the Seabees have been in the past few years. Seabees have been in Palau and Yap for 20 years, providing construction, training and medical services to the Palauans and Yapese as part of the civic action program. They've been on board Navy ships on South Pacific cruises, stopping at remote islands to blast new channels for fishing boats, to repair water lines, schools, and in one case, to repair an incubator that hadn't worked in years, just two hours before a premature baby was born needing the incubator.

RADM Jack E. Buffington, CEC, USN

Seabees have been to American Samoa following Typhoon Ofa, to the Philippines for earthquake recovery and to San Francisco following the Loma Prieta earthquake. They have also been to Charleston, S.C., Puerto Rico, Antigua and the Bahamas after Hurricane Hugo, to Tunisia following catastrophic floods and to northern Iraq to help the Kurds.

Seabees are afloat in amphibious construction battalions, are diving in underwater construction teams, and are working on shore stations in construction battalion units and our construction battalion maintenance unit. They are in our naval mobile construction battalions in homeport and deployed all over the world. They work for public works centers, officers in charge of construction, shore stations and the State Department. Seabees have been almost everywhere supporting every service and even the President of the United States.

The NCF has a rich and successful history that we are all proud of. However, our history is continually growing as today's Seabees work around the world in war and in peace to help people everywhere. Every day, today's Seabees live, work and play by the motto: "We build and fight, with all our might. CAN DO!"

Jack E. Buffington
Rear Admiral, CEC, USN
Commander, Pacific Division
Naval Facilities Engineering Command
and
Commander, Naval Construction Battalions,
U.S. Pacific Fleet

An NMCB Seven Alpha Company crew lays asphalt. (Photo by PH1 Bruce Parker)

The Seabees Go to War

By Karen Fedele

On June 8, 1991, the Seabees in the National Victory Parade marched proudly down Constitution Ave. in Washington, D.C. They marched past the flag-waving onlookers who lined the street 10-deep and past the reviewing stand where President Bush and other top government and military officials sat. Some cheers and cries of "Seabees! Seabees!" rang out from the onlookers. The Seabees had come a long way from the hot—and cold and rainy—days and nights in the desert of Southwest Asia during Operations Desert Shield and Storm.

•••

Seabees were in Southwest Asia supporting the Marines from August 1990 through June 1991. In all, more than 5,000 Seabees participated in the operations. During those months in Southwest Asia, the Seabees worked seven days a week, around-the-clock in 12-hour shifts, often in temperatures nearing 120 degrees. They built base camps, aircraft parking aprons, roads, ammunition supply points and hospitals; unloaded and loaded ships; guarded camps; conducted amphibious operations and participated in a deception operation on the Kuwaiti border.

Conditions were rough—the heat, the sand, the rain, logistical problems and the threat of chemical warfare—yet the Seabees were able to do what was asked of them, frequently completing the jobs ahead of schedule. And they did it safely. No Seabees were killed and only a handful were injured.

"When you look at the whole scope of what went on, I think we were 98 plus percent successful, highly successful," says Captain Michael Johnson, CEC, USN, who commanded the Third Naval Construction Regiment. "We carried out the

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Karen Fedele is the editor of the Navy Civil Engineer magazine and the assistant public affairs officer at the Naval Facilities Engineering Command Headquarters in Alexandria, Va.

Desert Shield/ Storm Seabees: Where They Served

The Persian Gulf region is shown above. The map to the left is an enlargement of the boxed area.

mission, we did an outstanding job."

Chronology

On Aug. 2, 1990, the Emirate of Kuwait was invaded by Iraq, its neighbor to the north. To deter possible further aggression by Iraq against the Kingdom of Saudi Arabia (Kuwait's neighbor to the south) the United States deployed military forces to Southwest Asia. The deployment of Marine Corps Forces (First Marine Expeditionary Force, known as I MEF) resulted in the call for Naval Construction Force support for Marine operations. (See box for a listing of all the NCR elements that participated in the operations.)

The Seabees were notified on Aug. 7 that they would be included in Operation Desert Shield. Preparations immediately began to deploy four battalions—Naval Mobile Construction Battalions Four, Five, Seven and 40. The Seabees began packing up their construction equipment and waiting for planes and ships to arrive to transport the equipment to Saudi Arabia.

On Aug. 13, the first wave of Seabees arrived in Saudi Arabia. An element of Amphibious Construction Battalion One with 210 personnel and their skipper, Commander Rich Haas, CEC, USN, helped offload U.S. Marine Corps equipment and supplies from the Maritime Prepositioned Force Ships.

Within two days of notification, 100 Amphibious Construction Battalion Two personnel mobilized between Aug. 10 and 20 on the amphibious ships leaving Norfolk, Va., for the Gulf. While in the Gulf, they conducted numerous exercises with the Marines in preparation for amphibious assaults.

On Aug. 17, 10 days after Operation Desert Shield began, Commander, Construction Battalions Pacific Fleet Forward Deployed—the senior Seabee Command unit—personnel arrived in Al Jubail, Saudi Arabia. (COMCBPAC Forward Deployed and personnel from I MEF headquarters were the predecessor of the Third NCR. The Third NCR was a reserve regiment recalled to provide command and control over the deployed battalions.)

UT3 Douglas Havens (Left) and BU3 Jason Mattingly are ready for NMCB Five's movement into Kuwait on Feb. 25, 1991. (Photo by JO1(AW) Paul Russo)

The second wave of Seabees were personnel from Construction Battalion Units 411 and 415. The two CBUs, under the leadership of Lieutenant Susan Globokar, CEC, USN, and Lieutenant Lynne Bever, CEC, USN, were integrated into Fleet Hospital Five in Al Jubail. They erected and maintained a 500-bed hospital facility.

NMCB 24 participated in CBR (chemical, biological and radiological) training prior to deploying to Saudi Arabia.

NMCB 74 packs out from CBC Gulfport for Southwest Asia.

On Aug. 27, CAPT Michael Johnson, who later led the Seabees in the Victory Parade, arrived in country with the remaining elements of COMCBPAC Forward Deployed. The first NMCB air det elements arrived that same day. All four air dets augmented with additional men and equipment had arrived by Sept. 14. An air det is a group of 89 men who can operate for 30 days without resupply.

NMCB 40's main body was the first to arrive in country (on Sept. 27), 51 days after the start of mobilization.

NMCB Five came from its homeport in Port Hueneme, Calif. NMCB Four redeployed from Camp Moscrip, Puerto Rico. NMCB Seven redeployed from Camp Shields, Okinawa. NMCB 40 redeployed from Camp Covington, Guam.

NMCBs Four, Five and 40 went to Saudi Arabia, and NMCB Seven to Bahrain. In December 1990, NMCB 74 relieved NMCB Seven and NMCB 24 (a reserve unit recalled to active duty) relieved NMCB Four.

By Oct. 18, all four NMCBs had arrived. The mobilization was complete. By early February 1991, the mobilization encompassed 2,800 Seabees and approximately 1,375 pieces of equipment.

NMCB Four's air det set up a camp in a partially completed contractor camp near a soccer stadium in Al Jubail. Four's main body and NMCB 40 were at a contractor camp which had been built by the Saudi government to house foreign workers. The Seabees called it Camp Rohrbach in honor of Rear Admiral Richard M. Rohrbach, CEC, USN, who had died on active duty on Oct. 7, 1990. NMCB Five set up a camp (Camp Stethem, named in honor of SW2 (DV) Robert Stethem who was killed as a terrorist hostage on June 14, 1985) off the runway at the air base in Al Jubail. NMCBs Five and 40 were joined in December by Details 15 and 16 from NMCB One, who had deployed from Rota, Spain.

NMCB Seven went to Shaikh Isa (where they named their camp, Camp Tom Orr in honor of a Seabee who had died) in Bahrain.

What they built

The Seabees' first priorities upon arriving in Saudi Arabia revolved around the four airfields where the Marine's Air Combat Element had deployed with its Marine Air Groups. The Seabees built aircraft parking aprons and base camps to house the Marines flooding into the area as the build-up progressed. Both tasks were undertaken within hours of arriving in country, and most projects were multi-battalion efforts.

As Steelworker Chief Terry Gurley from NMCB Five remembers his arrival in Saudi Arabia, "When we walked off the airplane, a couple of majors from the Marines grabbed us and said, 'I'm glad you're here. Here's what you need to go to work.... You're not working yet.' " The Seabees began building runways that day.

The second priority was to build

ammunition supply points for the tremendous amounts of ordnance being brought into theater. As time went by, the emphasis shifted to improving the living conditions in the Marine camps.

The Seabees did master planning for the Marines at Al Jubail. Thousands of people were moving in, and decisions, points out CAPT Johnson, had to be made—where to put the people, buildings, galleys, parking, water, roads and latrines. How many latrines? How much lumber would be needed? Where would they get the supplies? All of these questions and more had to be answered.

"The Seabees are great. If I wasn't a Marine, I'd be a Seabee."

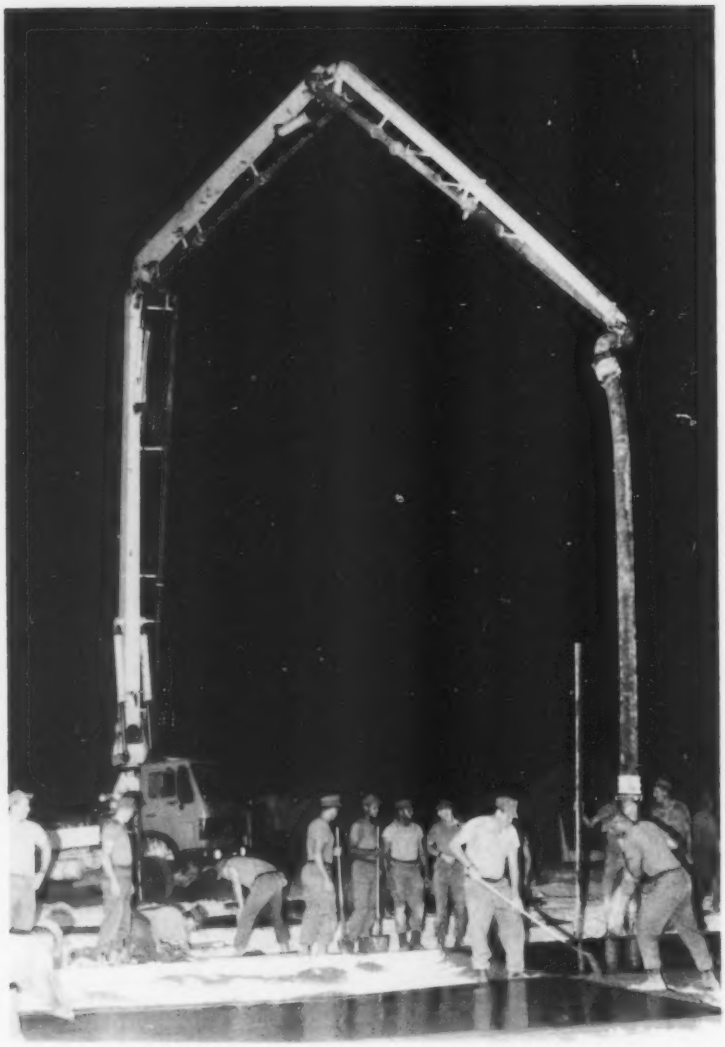
— Gunnery Sergeant James M. Goff

Base camps were built for the Third Marine Air Wing; Marine Air Groups 11, 13, 16 and 26; First Marine Division; and Second Marine Division. Other projects focused on improving operational readiness of the Marine Air Wing: laying AM-2 matting, enlarging aircraft parking aprons, and building hangars, roads and galleys.

Meanwhile in Shaikh Isa, Bahrain, the Seabees of NMCB Seven were busy supporting the Marines, Army and Air Force. Projects in Bahrain included erection of strongback tents, Southwest Asia huts, an aviation ordnance storage facility, a munitions transfer road, and a 60,000-

Chronology

Location	*Dates*	*Number of Personnel*
COMCBPAC Forward Deployed		
Al Jubail	Aug. 17, 1990 - Dec. 14, 1990	31
Third NCR (Formerly CBPAC Foxtrot Delta)		
Al Jubail	Dec. 15, 1990 - April 1, 1991	36
Ras Safinayah	Jan. 6, 1991 - Feb. 7, 1991	12
Al Khanjar	Feb. 7, 1991 - March 1, 1991	12
Al Jaber, Kuwait	Feb. 26, 1991 - March 1, 1991	75
(Composed of Third NCR, NMCB Five and NMCB 24 personnel)		
NMCB Four		
King Abdul Aziz	Aug. 13, 1990 - Dec. 17, 1990	125
Camp Rohrbach	Sept. 13, 1990 - Dec. 17, 1990	500
NMCB Five		
JNAF	Aug. 29, 1990 - April 1, 1991	602
Al Kibrit	Jan. 6, 1991 - Jan. 30, 1991	250
Al Qaraah	Jan. 30, 1991 - April 1, 1991	250
NMCB Seven		
Shaikh Isa	Sept. 11, 1990 - Dec. 9, 1990	632
ASU Bahrain	Sept. 11, 1990 - Dec. 9, 1990	25
NMCB 24 (Relieved NMCB Four)		
Camp Rohrbach	Dec. 12, 1990 - April 1, 1991	588
Tanajib	Jan. 22, 1991 - Feb. 27, 1991	120
Al Qaraah	Feb. 7, 1991 - March 4, 1991	50
NMCB 40		
Camp Rohrbach	Sept. 14, 1990 - March 16, 1991	524
Tanajib	Jan. 22, 1991 - Feb. 27, 1991	120
Al Khanjar	Feb. 7, 1991 - March 4, 1991	50
NMCB 74 (Relieved NMCB Seven)		
Shaikh Isa	Dec. 4, 1990 - April 1, 1991	65 (Initially 587)
Ras Al Mishab	Dec. 14, 1990 - April 1, 1991	522
Al Kibrit	Jan. 30, 1991 - March 4, 1991	150
NMCB One Details 15 and 16 (Detached to NMCB Five and 40, respectively)		
Al Jubail	Dec. 8, 1990 - March 5, 1991	200
(Approximately 25 men joined NMCB Five at Al Kibrit)		
CBUs 411 and 415		
Al Jubail	Aug. 22, 1990 - March 22, 1991	101
NCFSU Four Det Alpha		
Al Jubail	Feb. 5, 1991 - April 1, 1991	56
UCT One		
Al Jubail	Oct. 1990 - Dec. 1990	7
Shipboard, Dubai, United Arab Emirates	Jan. 1991 - March 1991	26
UCT Two, Air Det Bravo		
Al Jubail	Feb. 5, 1991 - April 1, 1991	15
PHIBCB One		
Al Jubail	Aug. 12, 1990 - Present	8 - 25
Al Jubail	Aug. 12, 1990 - Sept. 20, 1990	210
Al Jubail/UAE	Jan. 20, 1991 - March 10, 1991	193
PHIBCB Two		
Shipboard	Aug. 14, 1990 - April 20, 1991	100
Al Jubail	Oct. 29, 1990 - Dec. 23, 1990	26
Al Jubail	Dec. 28, 1990 - Present	7 - 12
Jebel Ali, UAE	Jan. 26, 1991 - March 28, 1991	397



NMCB Seven's Bravo Company pours concrete at night to beat the tough daytime desert heat. (Photo by PH1 Bruce Parker)

square foot aircraft parking apron. A det was sent 20 miles north to build and remodel administrative spaces for incoming Navy personnel at the Naval Administrative Support Unit.

The number of troops in the area swelled to a quarter of a million by November. In December, the decision was made to double the number of troops. The Seabees responded by building six 2,500 man camps to receive people and give them a place to marry up with their equipment before phasing north into the desert. During this period, the Seabees continued to develop the facilities they had been working on as well as phase north and construct facilities for the Marines.

PHIBCB Two and Underwater Construction Team One, as part of the Naval Support Element, mobilized in January in preparation for logistics over the shore (LOTS) and offshore petroleum discharge system (OPDS) operations.

As NMCB 74 relieved NMCB Seven in December, they immediately received the order to relocate the entire battalion from Bahrain 200 miles north to Ras Al Mishab, Saudi Arabia (20 miles from the Kuwait border). With trucks and planes, they made "Mobile" a true aspect of their name.

As the air war began on Jan. 16, 1991, the Third NCR and its units were staged to move into Kuwait to open roads and airfields, and to provide immediate battle damage repair.

On the third day of war, a small group of Third NCR personnel were in Al Jaber, Kuwait, to set up the I MEF command post and provide initial utility repairs to the airfield. Also, Third NCR personnel began repairs to coastal main supply route in southern Kuwait to assure logistical support.

In all their projects, the Seabees worked side-by-side with the Marines. The two groups developed a strong and special relationship.

"They (the Seabees) are great," says Gunnery Sergeant James M. Goff, the Marine military advisor with NMCB Seven. "If I wasn't a Marine, I'd be a Seabee."

"They did good," he added. "I'd go with them anywhere."

Major Projects

Here are highlights of some of the Seabees' major projects.

I MEF headquarters. The Seabees built the First Marine Expeditionary Force (I MEF) headquarters in Al Jubail for Lieutenant General Walter Boomer, who commanded the Marines in Southwest Asia. Seabees hardened the communications facilities, renovated existing facilities, constructed 12 Southwest Asia huts, and poured countless concrete slabs for tents. Additionally, they built five 20-foot steel security towers, which

they pre-fabricated at their camp then brought on site and erected.

Getting the materials to do the job was always a problem, according to Lieutenant Robert Fahey, CEC, USN, of NMCB 40. However, if the materials weren't available, he says, "The Seabees had the ingenuity and foresight to figure out something and make it work." For example, when they didn't have the wire mesh needed for guard towers, the Seabees stayed up all night and welded rebar together to make the mesh.

II MEF beddown. The construction of the beddown facilities for the Second Marine Expeditionary Force (II MEF) was the largest wartime multi-battalion Seabee project since Vietnam. Seven battalions—One, Four, Five, Seven, 24, 40 and 74—worked on the project, with NMCB Five being the lead.

Construction of this camp to house 15,000 Marines began in late November. The camp was built in six modules each holding 2,500 men. Each camp module contained berthing, office spaces, showers, toilet facilities, a galley, roads and parking areas.

The Seabees worked seven days a week, in two 12-hour shifts.

The camp, dubbed "Wally World" by the Seabees after the fictional vacation destination of the family in the movie "National Lampoon's Vacation," was completed in just 36 days.

Desert roads. Beginning in Janu-

Seabee Construction Projects

- 10 camps: Total capacity of 42,500 people
- 1 enemy prisoner of war compound: 40,000 man capacity
- 4 major and 9 minor galleys: Total feeding capacity of more than 90,000
- 10 aircraft parking aprons: 7 million square feet of site preparation/AM-2 matting at 8 sites
- 4 runways (unpaved): 2 constructed, 2 repaired in the desert near Kuwait
- 12 hangars
- 4 ammunition supply points: 10 million square feet total area
  - 2 aviation supply points
- 4 medical facilities (includes 1 United States Air Force aero-medivac facility)
- Road maintenance: 200 miles of unpaved four-lane main supply routes/access roads
- Buildings: 4,945 total and 3,200 tent slabs
  - 4,100 strongback tents
  - 760 Southwest Asia huts
  - 85 guard towers
- Miscellaneous work
  - Defensive barriers
    - 2,000 steel hedgehogs/tetrahedrons
    - 500 concrete tank barriers
  - Built 2 Marine Air Wing command posts
  - Built 4 Marine Expeditionary Force command posts (rear and forward)
- Materials used
  - 7.7 million feet of lumber
  - 93,000 sheets of plywood
  - 110,000 feet PVC pipe
  - 1.4 million feet (262 miles) electrical wire
  - 53,000 cubic yards concrete
  - 255,000 cubic yards select fill
  - Estimated material expenditure of $18 million

(Statistics for the period Aug. 17, 1990, to March 31, 1991.)

Marine LCPL Noel Perez (left) and CMCA Ernie Alcomendas of NMCB Five roll a spare tire from a 5-ton truck. (Photo by JO1(AW) Paul Russo)

ary 1991, as the Marines started to move north, the Seabees began to concentrate on building and maintaining roads, called main supply routes, throughout northern Saudi Arabia. By the time the ground war started, the Seabees were maintaining approximately 200 miles of roads near the Kuwaiti border.

The main roads included an east-west corridor from Ras Al Mishab through Al Kibrit, continuing past Al Qaraah for a total distance of almost 100 miles. This six-lane-wide road was traveled daily by more than 500 heavy haulers and thousands of tactical vehicles. This and other roads were the logistical arteries for both the First Marine Division and the Second Marine Division during their preparation before and during the ground war.

Detachments from all four battalions mobilized to the battle front to keep the roads open on a 24-hour basis.

NMCB 40 Seabees in combat patrol training at Camp Rohrbach. (Photo by PM2 Ron Yniguez)

Living conditions

The Seabees worked seven days a week, in two 12-hour shifts. The only days they had off were Thanksgiving and Christmas. On a typical day, a Seabee awoke at 5:30 a.m., ate breakfast, worked for 12 hours (maybe taking some time off when it got too hot to work), showered, ate dinner, wrote a letter, and was in bed by 8:30 p.m.

Seabees ate well, and every NMCB lays claim to having had the best galley in all of Southwest Asia.

Seabees in Al Jubail and Bahrain had access to recreational facilities. Camp Rohrbach's facility boasted pool tables, ping pong tables, darts, pay phones, volleyball courts and VCRs for showing movies. Additionally, Camp 2-1/2, the area rec center, was only three miles away. It had an Olympic-sized pool and camels to pose with for photos.

Seabees showed their "Can Do" spirit and made their own gyms. Steelworkers in NMCB 40's Charlie Company, for example, fabricated weights, flat benches—everything found in a regular gym—from scraps leftover from their work to build the Flintstone Gym.

Seabee ingenuity showed itself in other areas. NMCB Four's air det was camped near a dump, where foraging Seabees found marble. They recycled it to make a patio for their tents and furnished the patio with furniture made out of scraps of wood.

After a long day of building camps or roads, the Seabees might attend a "sandbag party." The entire work shift would gather in a tent and fill sandbags for use in constructing bunkers.

The most anticipated part of the

day was reading the mail. The Seabees especially enjoyed reading the Any Service Member mail. Lieutenant Donald Grennon, CEC, USN, of the NMCB Four air det remembers that the Seabees greatly enjoyed letters from children. "The little kids...what was funny about their letters was how blunt they were, like writing 'I hope you don't die.' "

Hot, hot

When the first wave of Seabees arrived in Saudi Arabia and Bahrain in August, the heat was intense, frequently rising to the 120-degree mark. By the time NMCB 24 and NMCB 74 arrived in December, the temperatures had dropped dramatically, going down to the 30s at night and only up to the 70s during the day.

The high temperatures forced the Seabees to drink between eight and 12 quarts of water a day to keep from becoming dehydrated. Unfortunately, facilities were not always available to keep the water cool.

Seabees, however, soon learned a technique to cool down their water. They wrapped a wet sock around a plastic bottle containing water. As the water evaporated from the sock, the water in the bottle cooled down.

"Everybody had them [plastic bottles] hanging by the racks. It was the fashion," Equipment Operator Michael McPartland of NMCB Four's air det says.

Coping with the heat wasn't the only challenge. There was also the sand, gritty and getting in everything—food, clothing and machinery.

The sand was rough on the equipment. Construction Mechanic Andrew Morales of NMCB One, Det 16, says sand got into the machinery, causing it to break down faster and making it difficult to do maintenance. "You were just rolling around in sand trying to prevent sand from getting in the parts," he says. "And it was just impossible."

A K-span building under construction. (Photo by EQCM Herman C. Hart)

K-span Buildings: New and Fast

The Seabees built several types of buildings, including the newly introduced K-span, while in Southwest Asia. Here is a brief description of those buildings.

K-spans are metal buildings which look like large Quonset huts. They are constructed by feeding rolls of flat steel through an automatic panel forming machine, which produces curved, corrugated panels 1-foot wide. A crane then hoists the panels into place on steel forms. The arches are seamed together and tack welded to angle iron running through the forms, held in place by pipe sections with threaded rods. When all the sections are up, concrete is placed in the forms. After the rods are removed and the forms are stripped, a floor is poured and the building is complete. The buildings can be erected 80 times faster than by conventional means.

Sprung instant buildings have a metal frame with a fabric cover.

Strongback tents have wood frames with fabric sides. They are placed on concrete slabs.

Southwest Asia huts (SWAHUTS) have wood frames, plywood sides and tin roofs. ❑

Many of the Seabees were surprised by the heavy rains in the desert from January through March. It rained so much during this period that grass grew on the desert. By the end of March, the grass had grown to the height of 10 inches in some parts of the desert.

A sight—and smell—many Seabees won't forget for some time is the smoke from the oil wells burning in Kuwait. From Camp Rohrbach, looking north to the Kuwaiti border, Seabees could see a haze. Driving north, "when you really got up close, it was like going into darkness," remembers LT Fahey. Farther north, the sun often wouldn't break through the haze caused by the burning oil wells until 1 or 2 in the afternoon. Those mornings

NMCB 40 Seabees grade sand in preparation for building an aircraft apron extension. (Photo by PM2 Ron Yniguez)

were cold and the Seabees called them the "nuclear winter."

Special projects

In mid-February 1991, the Seabees played an important role in a deception operation called Task Force Troy on the Kuwaiti/Saudi Arabian border. Their mission: to deceive the Iraqis into thinking the Eighth Marines were still in the area. Working in camp for 24 hours a day for a two-day period, Seabees fabricated 15 Howitzer and 25 Abrams tank decoys. Then, convoying by night, 21 Seabees traveled with the Marines to the rolling sand dunes on the border.

At night, in the rain and under a moonless sky, with only chemical sticks for light, they set the decoys up in groups of three and five. With the cammy netting over them, the decoys appeared real.

Throughout this operation, the Seabees could hear the bombing underway in Kuwait, according to Constructionman Master Chief Richard Van Roekel of NMCB 74.

A "fun" project was the construction of a 1,500-foot runway with AM-2 matting for remotely piloted vehicles. The RPVs, small remote unarmed aircraft, were used by the Marines to circle Iraqi positions to allow the Marine gunners to adjust their aim.

However, no designs for RPV runways existed. The Seabees said, "Who knows what a RPV facility looks like?" says Lieutenant Commander William Smith, CEC, USN, of NMCB Five. "Let's just go out and build one." And they did.

Additionally, Seabees also built a 40,000 man enemy prisoner of war camp.

...

NMCB Seven's operations officer, Lieutenant Commander Mark Sarles, CEC, USN, echoes the feelings expressed by other CEC officers and Seabees about being in Operations Desert Shield and Storm:

> "I think the guys really learned a lot about what the Seabees are really about, that it's not going to Okinawa then going to Puerto Rico.... This is why we exist—to pack up all that stuff and go over there and help the Marines. I think we did a pretty good job. All the Marines that we were associated with, from the very senior folks—two and three star generals—down to the enlisted Marines really appreciated us being there and all the help that we had been to them. I think, and I hope, that we made their lives a little easier." ❑

Seabees from the NMCB Four built this deck and chairs from scrap materials.

Not All the Recall Action Was in the Persian Gulf

By JO1 Calvin Gatch Jr.
and JOSA Gary Boucher

Not all Naval Reserve Seabees recalled to active duty in support of Desert Shield/Storm deployed to the Persian Gulf. Almost 60 percent of the 2,800 recalled Seabees performed critical work in other parts of the world.

Reserve Seabees were stationed from Adak, Alaska, to the Philippines; from Washington, D.C., to Japan. They helped load out ships in the Gulf of Mexico, trained reservists being deployed to the Persian Gulf at Port Hueneme, Calif., and worked on construction projects in Korea and Puerto Rico—all in support of the war effort.

The work performed by reserve Seabees has been praised from the highest echelons of the Navy Department down to the field commanders.

Reserve Naval Mobile Construction Battalion 23, headquartered at Fort Belvoir, Va., was recalled in late November and early December 1990. Seven hundred and forty-four of its members were deployed in support of the Commander-in-Chief, Pacific Fleet. They worked on construction projects on Guam; Midway Island; Adak, Alaska; Pohang, Korea; and Okinawa, Kami Seya, Misawa and Sasebo, Japan.

RNMCB 16, headquartered at Los Alamitos, Calif., was recalled in early January 1991. Four hundred thirty-two of its members were deployed to Roosevelt Roads, Puerto Rico, in support of Commander, Construction Battalions Atlantic. They backfilled for active duty Seabees sent to the Persian Gulf.

Two hundred fifty members of Naval Reserve Public Works Center Subic, headquartered in Alameda, Calif., were recalled in September and October 1990 and sent to the Philippines to replace active duty Navy Seabees sent to Desert Storm. One hundred fifty of these Seabees then redeployed to Bahrain and Al Jubail in early 1991.

Also, 350 personnel from various selected reserve detachments of Naval Beach Group Two and Amphibious Construction Battalion Two were recalled. Thirty of these personnel filled homeport billets while the remainder deployed to the Gulf.

Ninety members of Naval Reserve Construction Battalion Center Port Hueneme, Calif., were recalled in September 1990 and February 1991. Augmenting the staff at Port Hueneme, the Seabees prepared equipment brought out of the Prepositioned War Reserve Material Stock for transfer to the Persian Gulf and to backfill equipment assets at alert stations which had been forwarded into Saudi Arabia.

Sixty-nine members of Naval Reserve Construction Battalion Center Gulfport, Miss., were recalled in January 1991. They helped packout equipment and supplies aboard the USNS *Mercury* headed to the Persian Gulf. It was one of the largest ever shiploadings of its kind. Seabee reservists helped load 27,000 items worth more than $21 million onto the ship. The unit also assisted with logistical supply at CBC Gulfport.

Reserve Seabees also helped with four other packouts of tables of allowances that were sent to the Persian Gulf. Each packout consists of 85 containers of supplies and 300 pieces of Civil Engineer Support Equipment. In addition, reserve Seabees assisted with four packouts of weapons from the Naval Weapons Station, Crane, Ind.

Seventy-nine members of the 31st Reserve Naval Construction Regiment, headquartered at Santa Barbara, Calif., were recalled in January 1991. They assisted with training other reservists who had been recalled to active duty at Port Hueneme, Calif.

Fifty members of RNMCB 12, headquartered at Davisville, R.I., were recalled in February 1991. They reported to CBC Gulfport. A small contingent later joined RNMCB 16 in Puerto Rico.

Forty-six members of RNMCB 13, headquartered at Peekskill, N.Y., were recalled in late February 1991. They deployed to CBC Gulfport. A small contingent later joined RNMCB 16 in Puerto Rico.

Twenty-two members of the First Reserve Naval Construction Brigade were recalled to the Reserve Naval Construction Force Support Detachment at CBC Gulfport. They assisted with administrative, logistical, supply, training and public affairs support of the recalled Seabee reservists. ❑

JO1 Calvin Gatch Jr. and JOSA Gary Boucher are with the Reserve Naval Construction Force in Gulfport, Miss.

Reroofing Guidelines

Successful Reroofing is Possible!

By Fred Minato, P.E.

"Why is it we can put a man on the moon, yet we can't successfully reroof my building?" "Isn't there a single roofing system which will perform satisfactorily for all our flat roofs?" These questions may frequently be asked by people getting new roofs.

In reply, it can be said that if all of our buildings with flat (low-slope) roofs were constructed exactly the same (simple rectangular short span structures with minimal amount of rooftop penetrations), it would be possible to use a single long-lasting roofing system for all these buildings.

Unfortunately, this is not true in the real world. Many Navy buildings are complex structures with parapet walls, expansion joints, penthouses and numerous rooftop penetrations such as air conditioning units, exhaust vents, vent pipes, skylights and roof drains. Many of the large shops and hangar type facilities have large roof monitors with window systems that eventually corrode and leak from wind-driven rain. Expanding the original facility with connecting building additions further complicates obtaining a satisfactory roof system. Also, the more A/C units added on top of the roof, the more penetrations or potential leak sources the roof will inherit. Equipment on the roof means the roof will be accessible to maintenance personnel and accidental roof damage may occur from rooftop traffic. Leaks from a worn-out A/C unit will cause early deterioration of the roof surface. Therefore, *each building requires its own particular roofing system.*

Nuclear roof moisture survey on a gravel surfaced built-up roof.

Successful reroofing is possible!

With a better understanding of the problem, a successful reroofing job is possible.

First, determine if complete reroofing or partial repair/maintenance of the roof is required. Is the roof deck deteriorated? Is there extensive moisture penetration in the roof insulation? If repairs have been unsuccessful and the new repair cost is about one-third of the replacement cost, then it may be time for the roof to be replaced. Age should **not** be a deciding factor to do partial repair or complete replacement of a roof. Some roofs between five and seven years old have failed prematurely; whereas roofs more than 20 years old are still performing well.

Secondly, analyze the existing roof conditions. Obtain historical data on the roof and determine the cause or causes for the roof failure. Was improper material, design, installation or inadequate maintenance the cause or causes for the failure? Take a few core samples of the existing roof system to verify the roof construction and condition. Many older roofs have been capsheeted (a roof over an existing roof) two or more times. Larger test cuts may be necessary in these older roofs to determine the condition of the roof deck. Ponding areas—low spots or permanent deflections in the roof deck—should be flagged. All parapet walls, reglets, counterflashing, scuppers, edges and other flashing systems must be fully inspected because flashing areas are the most vulnerable spots of a roof system.

To detect all sources of leaks, particularly for large roofs, a roof moisture survey is highly recommended. Normally, this specialized survey is conducted with nuclear, infrared or capacitance type equipment.

The survey will help zero in on the areas of wet insulation and provide appropriate repair guidelines. If the defects are discovered early enough, the roof can be restored through economical and timely repair and maintenance procedures.

Fred Minato is a maintenance engineer with the Pacific Division of the Naval Facilities Engineering Command in Pearl Harbor, Hawaii.

Roofing membranes

If the roof must be replaced, one of these roofing membranes may satisfy the requirement:

• **Built-up roofs** (BUR) generally consist of a three- or four-ply assembly surfaced with gravel, mineral capsheet or a contractor-applied coating. They are normally applied with hot asphalt. The reinforcing plies are generally fiberglass. Some cold-applied BUR systems have been introduced into the roofing market within the last five years. Only time will tell if the cold-applied BUR system is a viable roofing system.

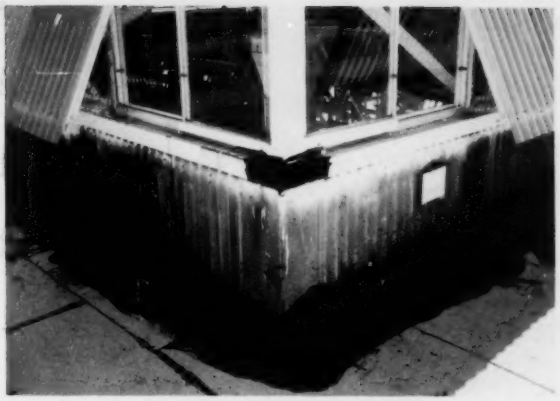
• **Modified bitumen** (MB) are prefabricated sheets with an asphalt base blended with polymer additives and reinforced with non-woven polyester fabric or fiberglass scrim sheets. They are applied either with a torch (atactic polypropylene) or hot asphalt (styrene butadiene). Both types are generally installed in a two-ply system with a fiberglass base ply or another MB sheet underlayment. The torch-on MB may be preferable for wet, humid areas since the torch helps to dry out the roof surface prior to laying in the MB ply. The MB system will degrade under sunlight and therefore requires a protective coating or factory impregnated granule surfacing. There is also a self-adhering type of MB, which does not appear to be in current use on naval buildings.

• **Elastomeric single ply systems**

• *Chlorinated polyethylene* (CPE) is a thermoplastic normally reinforced with a polyester mat. The seams are heat welded or solvent welded to form the membrane. It offers excellent resistance to oils, chemicals and the weather. It is compatible with bitumen and therefore can be installed directly over an asphalt roof.

• *Chlorosulfonated polyethylene* (CSPE) is an uncured reinforced material that has thermoplastic characteristics which allow the material to be heat welded or solvent welded. After installation, the material cures into a rubberlike material. The sheets must be stored away from heat, moisture and sunlight or they may cure prior to installation causing problems at the seams. CSPE is resistant to weathering and most chemicals and pollutants.

• *Ethylene propylene diene monomer* (EPDM) is a synthetic rubber produced in large sheets and is generally unreinforced. It is installed with solvent adhesives similar to contact cement. The EPDM system has excellent weatherability; is resistant to water-based contaminants; has poor resistance to most chemicals, fatty deposits and oil contaminants; and requires a fire retardant coating or ballast.



Damaged/corroded corner of a roof monitor.

• *Polyvinyl chloride* (PVC) is a thermoplastic copolymer with seams that are easily heat welded or solvent welded. PVC roofing is resistant to industrial chemical atmospheres and bacterial growth. It offers excellent fire resistance and easy seaming capabilities. However, it is subject to asphalt attack and therefore requires a separate sheet to prevent the plasticizers from being absorbed by a bituminous substrate. The newer reinforced PVC performs much better than the earlier unreinforced PVC, which shrank from expo-

Damaged vent pipe flashing.

Water ponding on entire roof surface, resulting in permanent deflection of this gravel surfaced built-up roof.

sure to sunlight and shattered in cold climates.

• **Standing seam metal** is becoming a viable reroofing alternative and can be used to reroof over an existing flat roof. The system is installed with hidden clips attached to purlins and subpurlins, which eliminate through-the-roof fasteners and allow the roof system to float over the existing roof deck. This roof system is not recommended where there are many rooftop penetrations.

• **Spray polyurethane foam** (PUF) has been used successfully to seal leaky metal roof systems. It is very adaptable to a variety of roof deck surfaces and has excellent insulating properties. PUF is lightweight and can be installed to create positive drainage. The system requires a protective coating to guard against ultraviolet degradation and should not be applied during windy conditions.

Mud cracking in smooth coated built-up roofs due to excessive application of asphalt coating.

Selecting a system

To select your roofing system, these factors should be evaluated:

• **Structural capacity**. If the new roofing system is heavier than the existing roofing system, a structural analysis must be made. The analysis should consider the roof deck, framing, and load bearing support system (such as columns and bearing walls) down to the building foundation. Selecting a roofing system that is lighter or the same weight as the existing roof system is preferred since the existing support system will not need additional reinforcement or major structural modifications.

• **Environmental considerations**. Chemical deposits from exhaust or airborne from nearby facilities can affect and destroy a roofing system. Exhaust drippings of cooking fats, oils and grease deposits from roof-mounted mechanical equipment are potential threats to some roofing systems. Check with the manufacturer to verify what effect the chemicals or fats will have on the roofing membrane. Have the manufacturer verify this in writing.

• **Rooftop traffic**. The more traffic on the roof, the more potential for damage to a roofing system. It makes good sense to limit the amount of rooftop equipment (such as air conditioners) and to control foot traffic on properly installed catwalks, walkway pads or protective pads around all equipment. It is best to follow the roofing manufacturer's advice on designing the walkway system.

• **Roof slopes and ponding**. Ponding water 1-inch deep over a 20-foot by 20-foot area adds 2,000 pounds of additional weight on the roof framing system. The larger and deeper the area of ponding, the greater the load and deflection of the roof deck. Additional roof drains can be added in these depressed areas to negate ponding. If the roof deck is flat, tapered insulation should be installed to create a minimum 1/4-inch per foot slope. However, it may be necessary to include provisions to raise the equipment curb and other penetrations to accommodate the increase in roofing level from the tapered insulation. Make sure the tapered insulation system will not create problems at the flashings of the equipment curb, walls and other areas.

• **Flashing**. Improper flashing is the primary cause for eight out of 10 premature failures of roofing projects. Improper flashing will shorten the life of any roofing system. A strong emphasis should be placed on designing and installing roof flashing. The flashing must be raised to a minimum height of 8 inches. To provide the appropriate

flashing height, all curbs and equipment mounts should be a minimum of 10 to 12 inches high. Whenever practicable, all rooftop equipment should be mounted on platforms high enough to accommodate future reroofing work below it. The additional cost to raise the existing penetrations will be well worth the investment.

Pitch pockets are seldom refilled or maintained properly and eventually become water collectors that leak into the roof system. Existing pitch pockets should be replaced with a boxed curb and rainhood or umbrella.

Appropriate flashing detail guidelines can be found in the National Roofing Contractors Association Waterproofing Manual.

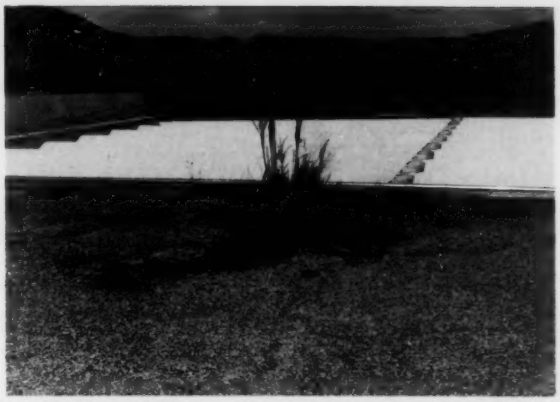
• **Accessibility.** How accessible is the roof to the contractor? Is the storage area inadequate, requiring frequent material delivery? Can chutes be used or are cranes required? The more difficult the accessibility to the roof, the higher the construction cost.

• **Application.** Some factors to consider are:
  - Can the facility be shut down during reroofing work?
  - How much noise disturbance is acceptable inside the building?
  - Will temporary overhead dust protection be required?
  - Is temporary roofing required?

For built-up roofs, modified bitumen and single-ply roof membrane application, a fully adhered system is strongly recommended instead of the mechanically fastened or ballasted systems. The fully adhered system is easier to maintain and any moisture penetrating area will be confined and therefore easier to track. The other systems will allow moisture in the roof system to migrate laterally, making maintenance a difficult task. In hurricane or typhoon-prone areas, a ballasted system should never be used.

• **Building codes and standards.** The selection process should ensure that the new roof system meets the fire and wind uplift resistance standards listed by the Underwriters Laboratories Building Materials Directory and Factory Mutual Approval Guide. Particular attention should be given to the perimeter and corner attachment requirements to prevent wind uplift.

• **General repair and alteration work.** Before reroofing, all general building repairs that will be performed from the roof top should be completed first. Removal and replacement of A/C units and other types of roof penetration work should also be done before reroofing. Using the new roof as a working platform will result in roof damage, leaks and also nullify the roofing warranty.



Vegetation growth at a damaged section of a gravel-surfaced built-up roof.

Successful reroofing

The successful reroofing task begins with a thorough evaluation of the existing roofing system components and identifying the conditions that caused the roofing failure. For large roofs, a roof moisture survey is highly recommended.

The survey will help identify the problem areas and provide a comprehensive condition survey report with appropriate repair guidelines to restore the integrity of the roof. The reroofing design should be a complete package designed by a knowledgeable architect-engineer experienced with roof systems that perform well in the geographic region of the building. ❑

Torch-applied modified bitumen with factory-impregnated mineral surfacing.

The NAVFAC Guide Performance Work Statement Program

By Herbert L. Hollar, P.E.

Starting in the early 1980s, spurred by increased public works department work requirements (with no corresponding increase in the work force), and required by increased emphasis on the commercial activities program, naval shore activities expanded their use of facilities support contracts for day-to-day work requirements previously performed by station in-house work forces.

These facility support and indefinite quantity construction contracts have now become a Naval Facilities Engineering Command contract growth industry, numbering more than 2,400 with an annual value approaching $750 million, and providing contract services at all levels of technical difficulty and types of work.

Before 1980, these contracts provided low skilled services such as custodial and refuse collection. With the growing work requirement, FSCs were expanded to encompass more technically complex services. These newer FSCs were found difficult to structure; difficult to specify in quantifiable terms; and, as a result, frequently resulted in low bids that could not easily be evaluated and rejected if considered unreasonable. There were no guide specifications as such, and activities frequently resorted to contacting other activities to obtain whatever specifications they had and then modifying them to fit their local situation.

FSCs differ from the more familiar NAVFAC construction contracts used to replace roofs, overlay pavements and paint buildings. In the construction contract, a specific statement of end result is expressed in words and drawings. Bidders know what they are bidding on, and the government contract inspectors know specifically what they should be looking for during and at the completion of the contract.

How could you write a specification to provide a service that did not have a specific, final finished product, and often was more of a statement of a required condition in which facilities, grounds or equipment must be maintained? To be biddable and inspectable, the contract specification must tell the bidder enough information to estimate the amount of required labor and materials. The specification must state the ongoing quality standard of contractor provided services.

While certain scheduled services such as preventive maintenance, refuse collection services or boiler plant operation could be adequately identified and scheduled in the specification, it was difficult for the activities to provide precise definitions of desired service quality. Also, the labor effort required to produce a specific product or service to specification was not apparent to all potential bidders, nor did every potential contract inspector have the same set of quality standards in mind as they attempted to evaluate the contractor's effort.

In short, the work, considering its location and environmental considerations, was not the type readily adaptable for contracting; but because of the diminished work force, growing facilities maintenance needs or the commercial activities program, the work had to be packaged in a form that was contractible and subsequently inspectable.

Herbert L. Hollar is the head of the industrial engineering branch at the Southern Division of the Naval Facilities Engineering Command in Charleston, S.C.

Guide performance work statements

NAVFAC began to develop guide performance work statements for the most frequently required services. Each engineering field division was assigned to develop specific GPWSs. Between 1980 and 1983, 21 GPWSs were developed by various EFDs and issued as draft GPWSs.

With the completion of this GPWS development effort, the emphasis shifted to revising these GPWSs to reflect the most current contracting techniques and technical requirements. To accomplish this, NAVFAC decided to consolidate the continuing effort at one location.

In 1985, NAVFAC assigned day-to-day management of the GPWS program to its Southern Division in Charleston, S.C., which now develops and updates the NAVFAC GPWSs and the related industrial engineering techniques supporting the FSC process.

A GPWS staff rewrites the GPWS drafts, with emphasis on uniformity and current quality assurance techniques. As they are completed, GPWS drafts are sent to NAVFAC, the EFDs and selected public works centers for a 45-day review and comment period. Appropriate comments resulting from this review are incorporated and the draft is forwarded to NAVFAC headquarters for final approval. SOUTHDIV then sends hard copies and various types of word processing media disks to all EFDs for distribution to requesting activities in their EFD areas of responsibility.

Each GPWS contains a User's Guide, guide PWS and recommended QA plans for the primary contract services and a User Feedback Comment Sheet. The User's Guide provides:

- Advice to the specification writer on tailoring the GPWS to meet local

More on page 32

Available NAVFAC Guide Performance Work Statements

	Date
Buildings and Structures (Other than Family Housing)	July 82
Bus Services	Feb. 87
Central Heating Plant and Distribution Systems Operation Repair, and Maintenance	Sept. 87
Custodial Services	March 88
Electric Power Generation, Heating Plant and Steam Distribution System Operation, Maintenance, and Repair	June 89
Elevator Maintenance Services	Nov. 86
Grounds Maintenance Services	Sept. 88
Guard Services	Feb. 90
Hazardous Waste Management Services	Nov. 86
HVAC, Refrigeration Plant, and Compressed Air Plant Operation, Maintenance, and Repair	May 87
Hospital Housekeeping Services	Nov. 87
Maintenance of Military Family Housing	Nov. 87
Operation and Maintenance of Electrical Distribution and Emergency Generation Systems	April 87
Pest Control Services	Oct. 87
Rail Facilities Maintenance and Repair	June 87
Solid Waste Collection and Disposal	Aug. 87
Surfaced Areas Maintenance	June 85
Operation of Telephone/Communications Systems	June 87
Transportation Operation and Maintenance	Jan. 83
Wastewater Collection Systems and Treatment Facilities, Operation and Maintenance	Aug. 89
Water Plants and Systems	Feb. 87

FIRE I Moves to Its New Home at the Chesapeake Beach Detachment

By Charles R. Senerius
and
Colleen Coggins

FIRE I is the Naval Research Laboratory's facility for studying fires in enclosed spaces. It has been used in developing several new passive fire safety and active fire protection systems for the new SEAWOLF class submarines. Built at NRL in Washington, D.C., in 1979, this 10,000 cubic foot facility was moved in 1990 to NRL's Chesapeake Beach Detachment in Chesapeake Beach, Md. It was a logistically complex move over land and sea, one that had to be completed without damaging this valuable testing facility.

More than 500 fire experiments have been conducted in FIRE I. Some of the materials and systems evaluated include new insulations, electrical cables and fixed suppression systems. The large data base (which would cost millions of dollars to duplicate) and the difficulty of exactly reproducing FIRE I reinforced the desire to move it without completely dismantling it.

FIRE I is now fully operational at its new location, where it joined other NRL test facilities, including a simulated submarine bilge, aircraft carrier flight-deck pad, fire research building and hydraulics laboratory.

From the Washington site, FIRE I was towed down the Anacostia River and through the Chesapeake Bay to its destination at CBD. Specially designed equipment and innovative techniques were used to make the trip a success. This article examines the equipment and techniques used.

Preparation for the move

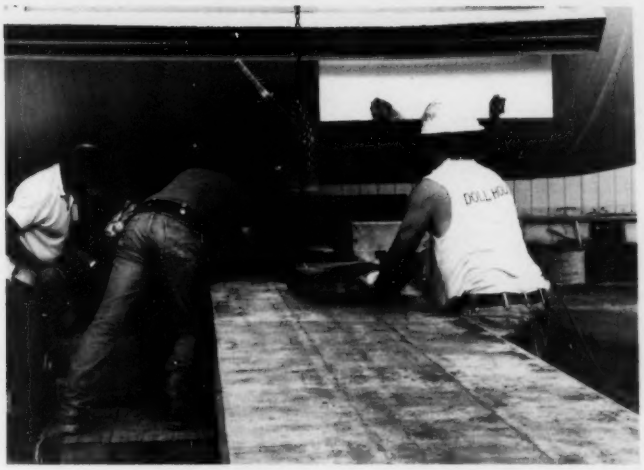
On Aug. 21, 1990, the Military Traffic Management Command, Falls Church, Va., awarded movement of Fire I and its command trailer to Lockwood Brothers Inc. of Hampton, Va.

On Sept. 5, Lockwood mobilized their men and specialized heavy hauler moving equipment at the NRL Fire I and waterfront project locations.

On Sept. 6 and 7, Lockwood jacked, lifted and welded steel I-beams under Fire I and its command trailer for lifting and movement to the wa-

FIRE I arrives at its new home at Chesapeake Beach Detachment.

Charles R. Senerius is a traffic manager in the material management division at the Naval Facilities Engineering Command in Alexandria, Va. Colleen Coggins is a project manager in the public works department at the Naval Research Laboratory in Washington, D.C.



FIRE I is dismantled for transportation to Chesapeake Beach Detachment.

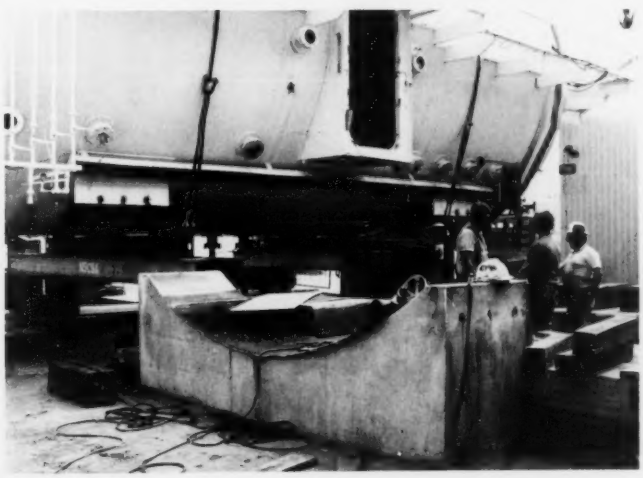
terfront tug and barge location, approximately 2,000 feet distant.

On Sept. 7, Lockwood Marine, Inc., a subsidiary to Lockwood Brothers, had their tug *Antares* (65 feet long by 24 feet beam by 8 feet height) preposition its barge Number One (200 feet by 40 feet by 10 feet) at the NRL quaywall during high tide. Fire I and its components weighed approximately 66 tons and measured 46 feet 6 inches in length by 19 feet 4 inches in diameter. The command trailer weighed approximately 14 tons and measured 60 feet by 12 feet by 24 feet. The weight and dimensions of each shipping unit required the carrier to use a variety of specialized equipment at both origin and destination for partial dismantling and reassembling these units.

Movement from NRL to Chesapeake Beach Detachment

On Sept. 8, FIRE I was partially dismantled, raised off its foundation, placed onto a specially designed and fabricated steel I-beam cradle and loaded onto the carrier's hydraulic trailer. The trailer was towed by a 400 horsepower tractor to the NRL waterfront location, backed onto the barge and lowered by the hydraulic trailer onto a custom-built platform on the barge. FIRE I was secured to the barge's deck, and the trailer was returned to the job site for movement of the command module.

The command module was loaded onto the trailer by two heavy lift truck-mounted cranes and moved to the barge waterfront location. The trailer was backed onto the barge. The command module and trailer were secured to the deck of the barge for ocean tow to their final destination, Chesapeake Beach Detachment. Both units arrived by barge at CBD on Sept. 10. Shortly afterward, the carrier conducted the offloading operations in reverse of the NRL operation.



The dismantling of FIRE I continues.

FIRE I is backed onto the barge in preparation for tow up the Potomac River and into the Chesapeake Bay en route to Chesapeake Beach Detachment.

Special contractor techniques and equipment for moving FIRE I

Movement of Fire I to the waterfront and onto the barge was accomplished by using a 400 hp tractor connected by a fifth wheel to a fully hydraulic self-leveling (34 inches to 56 inches) platform trailer (54 feet length by 12 feet width by 34 inches height) weighing 126,000 pounds, with 11 axles (eight wheels per axle), and with a cargo carrying capacity of 330 tons. The command trailer was loaded onto a specialized transporter by two 40-ton mobile cranes. The tractor was left engaged to the transporter, with its command trailer load, for the tug/barge movement to CBD.

The specially built hydraulic trailer used in this move was engineered and designed to Lockwood Brothers specifications. Depending on the weight and size of the shipping unit to be moved, the hydraulic trailer can be assembled into as many as seven combined sections to accommodate a variety of overweight or oversize shipments.

Lockwood Brothers constructed and installed special dunnage platforms that were welded to the barge's deck to secure the Navy cargo for the 140 nautical mile voyage to CBD. A portable trailer-mounted generator provided power support to the command trailer to operate air conditioning units during the voyage. The air conditioning units maintained a controlled temperature environment for the computers and other scientific equipment in the trailer.

On Sept. 9, the *Antares* with its barge in tow departed NRL around 11 p.m. and arrived at CBD around 6:30 p.m. on Sept. 10.

Due to severe water depth restrictions, sand bars and varying sea state conditions on the discharge approach to CBD, the *Antares* was only able to bring the "Big Barge" within 1,000 feet of the CBD shoreline discharge site.

These logistical discharge obstacles were over-

Fire I and its command trailer entering Chesapeake Beach Detachment for offloading.

Placement of three each 16-ton steel ramps to bridge the gap between the barge and shoreline had to be just right.

come by using a combination of the *Antares*, the *Endeavor*, a small 150 hp pusher boat and a 90-ton, truck-mounted crane. Each piece of equipment had tow lines hooked to the barge. The pusher boat and the shore based truck-mounted crane worked from 7 a.m. to 9 p.m. to bring the barge to within an acceptable discharge distance of the shoreline. Three 52-foot, steel-ramp sections were used to bridge the gap between the barge and shoreline. The ramps weighed 16 tons each and were 6 feet wide. The ramps had also been used to bridge the gap at the NRL load site.

The 400 hp tractor hauled Fire I the 6,000 feet from the waterfront CBD location to the destination location. However, it lost traction while trying to negotiate a steep and winding road. A 40-ton truck-mounted crane was used in conjunction with the tractor to complete the move.

The foundation platforms constructed for FIRE I and its command module were built by Chesapeake Beach Detachment public works personnel.

Placement of Fire I and its command trailer on their foundation pads at CBD was completed during the afternoon of Sept. 13, or nine days after the operation started. The successful movement of FIRE I was completed in less than the 30-day timetable specified by the government. ❑

The Navy team leader for the FIRE I move was Dr. Homer Carhart, director of the Navy Technology Center for Safety and Survivability at the Naval Research Laboratory. Other team members included Dr. Fred Williams, Colleen Coggins, Charles Senerius. Art McElroy represented the Military Traffic Management Command.

FIRE I gets stuck during uphill climb at Chesapeake Beach and requires the assistance of a 40-ton, truck-mounted crane

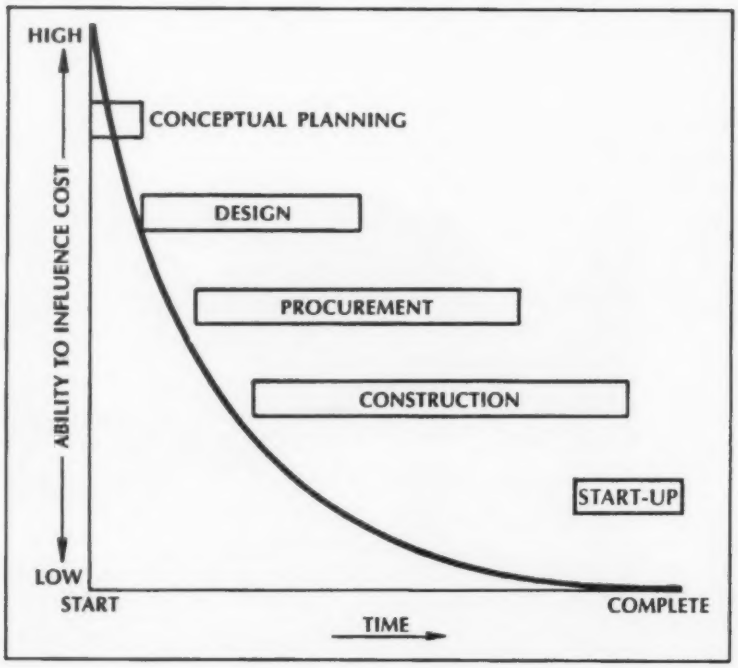
NAVFAC and the CII: Working Together Toward a Healthier Construction Industry

By Paul Miller

The Naval Facilities Engineering Command's involvement in the Construction Industry Institute is making a significant contribution to the long-range health of the U.S. construction industry. Through active participation in CII design and construction research projects, and CII board of advisors activities, NAVFAC personnel are helping forge the construction industry's future in the 21st century.

What is the Construction Industry Institute?

It is a consortium of construction owners, contractors, designers and academics which is dedicated to improving the cost-effectiveness of the U.S. construction industry. Hosted by the University of Texas at Austin, the CII is funded by its 91 members who are about evenly distributed between owners and contractors. Research activities are the heart of the CII. CII has identified six thrust areas



Ability to influence final cost over project life. (Chart courtesy of the Construction Industry Institute Constructability Task Force, Publication 3-1, *Constructability: A Primer*, July 1986.)

Paul Miller is the construction advocate at the Naval Facilities Engineering Command Headquarters in Alexandria, Va.

for research activities, identified by the acronym TOPICS. Current task forces in each thrust area are:

Technology

- Technological Survey
- Advanced Technological Systems
- Electronic Data Management
- Computer Integrated Design and Construction
- Modularization
- Technology
- Engineering/Procurement/Construction (Turnkey) Flexibility

Organization

- Project Organization
- Partnering
- Project Team Risk/Reward Allocation
- Constructability: Cost-Effective Implementation
- Project Team Building

People

- Employee Effectiveness
- Education and Training
- Construction Work Force
- Zero Accidents

Information

- Industry Data and Statistics
- International Construction
- Owner Centralized Engineering Departments

Controls

- Cost/Schedule Controls
- Quality Management
- Claims
- Contracting Phase II
- Change Order Impact
- Total Quality Management
- Overtime
- Quality Performance Measurement

Sigma

- Construction 2000
- U.S. Navy Demonstration Project
- Insurance
- Retrofit Projects

NAVFAC Participation in CII Activities

Captain Robert M. Gallen, CEC, USN, deputy commander for facilities acquisition, is the NAVFAC representative on the CII board of advisors, and William Quade, deputy assistant commander for construction, is the alternate. The board of advisors establishes task forces and action teams, funds specific research efforts and reviews research results. NAVFAC has 14 employees participating on CII task forces and action teams (see chart on page 26).

Employees who serve on a CII task force are committed to three years of developing and conducting research activities. Action teams, which are established for one year, implement tools for specific concepts developed by previous task forces. NAVFAC personnel benefit from task force and action team participation by being exposed to new ideas and by working closely with their industry counterparts. Further, our participation sends a strong signal to our contractors that team effort has a payback for owner and contractor alike.

"Most CII concepts are quality improvements in the planning, design and construction process."

CII Concepts

Each task force and action team publishes one or more documents which summarize the information learned and the concepts developed. These CII publications are then distributed to all member companies for their use and implementation.

The chart on page 24 illustrates a key CII concept, that the greatest potential for influencing the final cost of a project is during the conceptual planning stage.

CII focuses its research program on those subjects with the greatest potential payback, which can be as much as 50:1 for the up-front effort expended. CII concepts focus-

ing on the early phase of a project include: scope definition, design effectiveness, partnering and constructability.

Implementing CII concepts

Most CII concepts are quality improvements in the planning, design and construction process. As such, they can be implemented as quality initiatives under Total Quality Leadership. The quality management board should review current CII publications and select one or more concepts which are deemed appropriate to its business.

A process action team can then be chartered to study the existing process and determine how best to implement the CII concept.

Innovation

NAVFAC's participation in the Construction Industry Institute puts the command on the leading edge of innovation in the construction industry. By developing and implementing new concepts in the planning, design and construction process, NAVFAC will have the insight and flexibility to cope with diverse changes in the construction industry as it passes into the 21st century. ❑

Task Force and Action Team Members

Task Force	Member	Organization
Construction 2000	Frank Ruccolo	WESTDIV
Electronic Data Management	Deke Smith	NAVFAC HQ
U.S. Navy Demo Project	Vacant	- - -
Change Order Impacts	Gerald Hill	NORTHDIV
International Construction	John Grubbs	LANTDIV
Constructability Phase II	William Quade	NAVFAC HQ
Owner Central Engr Depts.	James Olsen	SOUTHDIV
Quality Performance Measure	Phil Otis	NORTHDIV
Project Team Building	CDR Dave Gorden	NAVFAC HQ
E/P/C Flexibility	Ken Robertson	SOUTHDIV

Action Team	Member	Organization
Pilot Projects	Joseph Calcara	NORTHDIV
Marketing	Richard Bogert	SOUTHWESTDIV
Plants/Division	James Bartlett	NAVFAC HQ

NAVFAC Success Stories

Total Quality Leadership success stories at the Naval Facilities Engineering Command were included in the report given by Rear Admiral David E. Bottorff, CEC, USN, at the chief of naval operation's Executive Steering Committee meeting in April in Pensacola, Fla. Here are some of those highlights.

Process Action Team successes at Public Works Center Pearl Harbor include:

- Changing utility meter readings from quarterly to monthly, reducing customer complaints 70 percent.
- Starting a six-week recycling program, which netted 19,402 pounds of mixed paper, corrugated cardboard, newspaper and aluminum cans.
- Combining and integrating data bases resulted in reducing financial hard copy reports 50 percent and reducing research time used to compare collection/disbursements by one-half.
- Eliminating manual financial logs saved more than $7,000.
- Restructuring the annual customer survey helped define future customer needs.
- Reducing four positions saved $86,000 by reorganizing and consolidating the business planning analysis division's workload.

Construction Battalion Center Gulfport accomplishments include:

- Consolidating the morale, welfare and recreation program saved $330,000 and won the Naval Military Personnel Command's First Place Medium Command Award for excellence in overall MWR program and golf program. The command also won Second Place Medium Command for excellence in child development programming.
- Using in-house microcomputer maintenance instead of a service contract resulted in a savings of more than $75,000 in labor charges.
- Using a new cost per copy contract and the new laser production printer saved more than $77,000.

TQL accomplishments at Public Works Center Pensacola include:

- Streamlining the processing of change orders, reducing the time from 13 hours, 49 minutes and 20 steps to 8 hours, 54 minutes and 12 steps.
- Reducing the average payment time to contractors from 6.2 days to 2.5 days in the facilities service contract office.
- Adjusting the process in the industrial treatment plant, resulting in a projected savings of $300,000 a year.
- Exceeding the customer's requirements in the collection and disposal of hazardous waste saved two man years. ❑

CNO Issues Guidelines for Making TQL a Success

Admiral Frank B. Kelso II, the chief of naval operations, has issued guidelines to use in making Total Quality Leadership a success. Here are some of those guidelines.

- Understand the mission and principles of the Navy. Have a clear grasp of how your command supports the Navy's mission and how the principles apply to your day-to-day actions.

- Quality is the essence of TQL. Insist on quality performance and material. Do the job correctly the first time.

- Know your job. Analyze and understand every facet of your responsibilities and those of your people.

- Words alone don't solve problems. Look first at the process and the system for faults and solutions, not the people. Improve the process, train the people.

- Quality training is a key to success. People must be fully trained to do their jobs. You are never too senior to learn. To do your best is not good enough unless you are properly trained to do the job.

- Use analytical methods to understand and improve your jobs. Graphs and charts, properly used, are invaluable tools in this effort.

- Inspect smarter. Inspections should be methods of learning and improvement rather than threatening events. As all learn to do the job correctly the first and every time, the number of inspections will decrease. ❑

CAD-2 Contract Award Is Anticipated in Summer 1992

A major milestone was reached in the long process to acquire state-of-the-art computer tools (hardware and software) for all aspects of facilities management. Proposals for the Naval Facilities Engineering Command's CAD-2 (Computer Aided Design Second Acquisition) RFP were received on July 23, 1991, after several due date extensions.

A source selection negotiated contracting process is being used for CAD-2. A value award, based on technical excellence of the proposals and pricing schedules, will be made. The technical evaluation includes a one-week test period during which each vendor's proposed hardware and software technical capabilities and interoperabilities are demonstrated and evaluated.

An evaluation team of members from the Naval Civil Engineering Laboratory, engineering field divisions, public works centers, Facilities System Office (FACSO), Civil Engineer Support Office, NAVFAC headquarters as well as Army Corps of Engineers and Air Force members has been put together.

There is a lot of misunderstanding about what CAD-2 is. CAD-2 is not geared to any specific facility management functional area such as planning or design. Instead, it will provide a broad spectrum of state-of-the-art computer tools with which to perform those functions. The underlying philosophy behind CAD-2 is to obtain commercially available hardware (communications, work stations, servers and peripherals) and software (operating systems, relational data bases, Geographic Information Systems, design and analysis programs and geometric modeling) to ensure high performance, ease of use and interoperability.

At the completion of the CAD-2 process, a requirements contract will be in place from which any Department of Defense activity will be able to order hardware and software, maintenance, training, and technical support for up to a 12-year period. The benefits of a centralized procurement are volume cost discounts on hardware and software, full service support, technology upgrades, standardization, and avoidance of complicated and expensive individual ADP procurement actions.

With proposals in hand, the technical evaluation and selection process can begin. Award is anticipated during the summer of 1992. While the names of the vendors that submitted proposals is procurement sensitive information and cannot be released, it is enough to say that based on the quality of the vendors competing, we are in a winning position regardless of the outcome. Based on the recent Naval Sea Systems Command CAD-2 award for ship design and engineering, expect the prices to be discounted well below commercial price lists, making the equipment affordable to all levels of facility management organizations.

RADM G.B. Estes Relieves RADM A.K. Riffey as NAVFAC Vice Commander

Rear Admiral G. Brian Estes, CEC, USN, relieved Rear Admiral A. Kent Riffey, CEC, USN, as the vice commander of the Naval Facilities Engineering Command and Deputy Chief of Civil Engineers on Aug. 6, 1991.

RADM Estes had been the deputy commander for facilities acquisition and deputy commander for public works at NAVFAC headquarters.

RADM Riffey retired effective Sept. 1, 1991.

Pearl Harbor Complex Proposed to Become a Superfund Site

In July 1991, the Pearl Harbor complex was proposed by the Environmental Protection Agency to become a National Priorities List Superfund site. The complex, which includes the naval shipyard, supply center, naval station, submarine base and public works center, contains more than 30 potential hazardous waste sources, some dating back to World War II.

NPL status results from an evaluation based on toxicity of contaminants present, availability of waste quantity information, sampling results, affected populations and documented releases of hazardous substances.

Designating the Pearl Harbor complex as an NPL site will heighten priorities and efforts on the part of the Navy and EPA to further assess the nature and extent of public health and environmental risks associated with the sites. Determination of remedial actions will follow closely. Clean-up efforts will be funded from the Defense Environmental Restoration Account.

NMCB 133 Seabees Return to Spain From Operation Provide Comfort

Seabees from Gulfport's Naval Mobile Construction Battalion 133 have returned to their deployment site in Rota, Spain, after more than five weeks in northern Iraq in support of Operation Provide Comfort.

After arrival in Iraq, NMCB 133 Seabees linked up with coalition counterparts to create shelters, establish comfort services, repair runways and provide fresh water for the hundreds of thousands of Kurdish refugees following Operation Desert Storm.

All facets of Seabee technical skills were applied during this operation. The Seabees joined forces with the Army's 18th Engineering Brigade Task Force and the 94th Combat Engineers to repair the runway at Sirsenk Airfield, originally built to service Saddam Hussein's summer palace. The airfield now serves coalition and United Nations forces as a logistics hub in the resettlement of Kurdish refugees.

NMCB 133 deployed from Gulfport in early March for a seven-month deployment to Rota, Spain.

Seabee Anniversary Update

The year 1992 will mark the 50th Anniversary of the founding of the Seabees. Plans are to use the entire year for reunions and celebrations. Our goals for 1992 will be met if we successfully honor our Seabee heritage, enhance the pride of being a Seabee and have fun!

Everyone will be a part of this great celebration. Active, reserve, retired and former Seabees will be recognized for their faithful contributions. In doing so, these reunion dates and locations have been established:

Kick Off Event and Dedication at Navy Memorial-Washington D.C.
Jan. 4-5, 1992

Seabee Ball
March 1992 — All CBCs (Gulfport, Port Hueneme, Davisville) and sites around the world

Seabee Days/Reunion
June 4-6 — Port Hueneme, Calif.

Seabee Open House
May 9-10 — CBC Gulfport, Miss.

Many other battalion reunions have been scheduled for 1992. For more information contact your unit coordinator, or any of these points of contact:

CBC Port Hueneme, Calif.
UCCM A. Violanti
Naval Construction Battalion Center
Military Affairs Department
Port Hueneme, Calif. 93043-5000
(805) 982-5650

CBC Gulfport, Miss.
C/CM Dwayne Vance
20th Naval Construction Regiment
Gulfport, Miss. 39501-5002
(601) 871-2724

CBC Davisville, R.I.
Odette Griffin
Naval Construction Battalion Center
Davisville, R.I. 02854-1161
(401) 267-6193

Seabee 50th Anniversary Committee
Captain B. J. O'Connell, CEC, USN
Naval Facilities Engineering Command (Code CB 50)
200 Stovall Street
Alexandria, Va. 22332-2300

We look forward to celebrating this great heritage in 1992.

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Performance work statements...

Continued from page 19

activity requirements

- Points to consider in assigning services to either the fixed-price or indefinite quantity portions of the proposed contract
- Suggested formats for the schedule of bid items and schedule of deductions
- Other information and suggestions to assist the specification writer in adapting the GPWS

The guide PWS includes portions of Section B (supplies or services and prices); Section C (technical specifications); and portions of Section J (attachments) showing examples of required historical data, how to list government-provided equipment and facilities, and examples of contractor invoicing instructions. The QA plans provide examples of suggested surveillance methods, procedures to accomplish the surveillance and typical surveillance report formats useful in recording the results of contractor performance. The User Feedback/Comment Sheet provides the GPWS user a means to provide SOUTHDIV comments and recommended changes to the GPWS.

The success in obtaining satisfactory FSC services is largely dependent on the quality of specifications that must contain specific, quantifiable requirements and quality standards that are expressly stated and can be measured.

By using NAVFAC GPWSs, public work activities can reduce the time required to develop FSC requirements, while improving the quality of potentially contracted services. GPWSs are available from the engineering field divisions. ❑

Correction

Oops! Due to a typesetting error, the symbol for microgram (μg) was mistakenly replaced by the symbol for milligram (mg) in Assessing Lead Hazards at Indoor Firing Ranges in the Spring 1991 issue of the magazine.

Have you considered the Reserves?

For a challenging, rewarding career...

If you are a young construction professional in civilian practice or civil service, or are a graduating engineering or architecture college senior who has already selected a civilian career path, the Reserve Civil Engineer Corps may have a place for you as a commissioned officer.

Qualified young professionals have the chance to achieve tremendous personal and professional satisfaction through...

✔ Direct appointment as an ensign, Civil Engineer Corps, United States Naval Reserve

✔ Challenging assignments within reserve Naval Construction Force units in your geographic locale, in areas paralleling active duty in the Seabees or in facilities management

✔ Annual active duty for training that is meaningful and rewarding

✔Development of leadership and technical skills that will carry over directly into your civilian profession

✔ New and lasting friendships and associations with other top-notch construction professionals

✔ Pay and responsibility that increase as you grow and advance

✔ A Naval Reserve retirement package for a little something extra in your old age

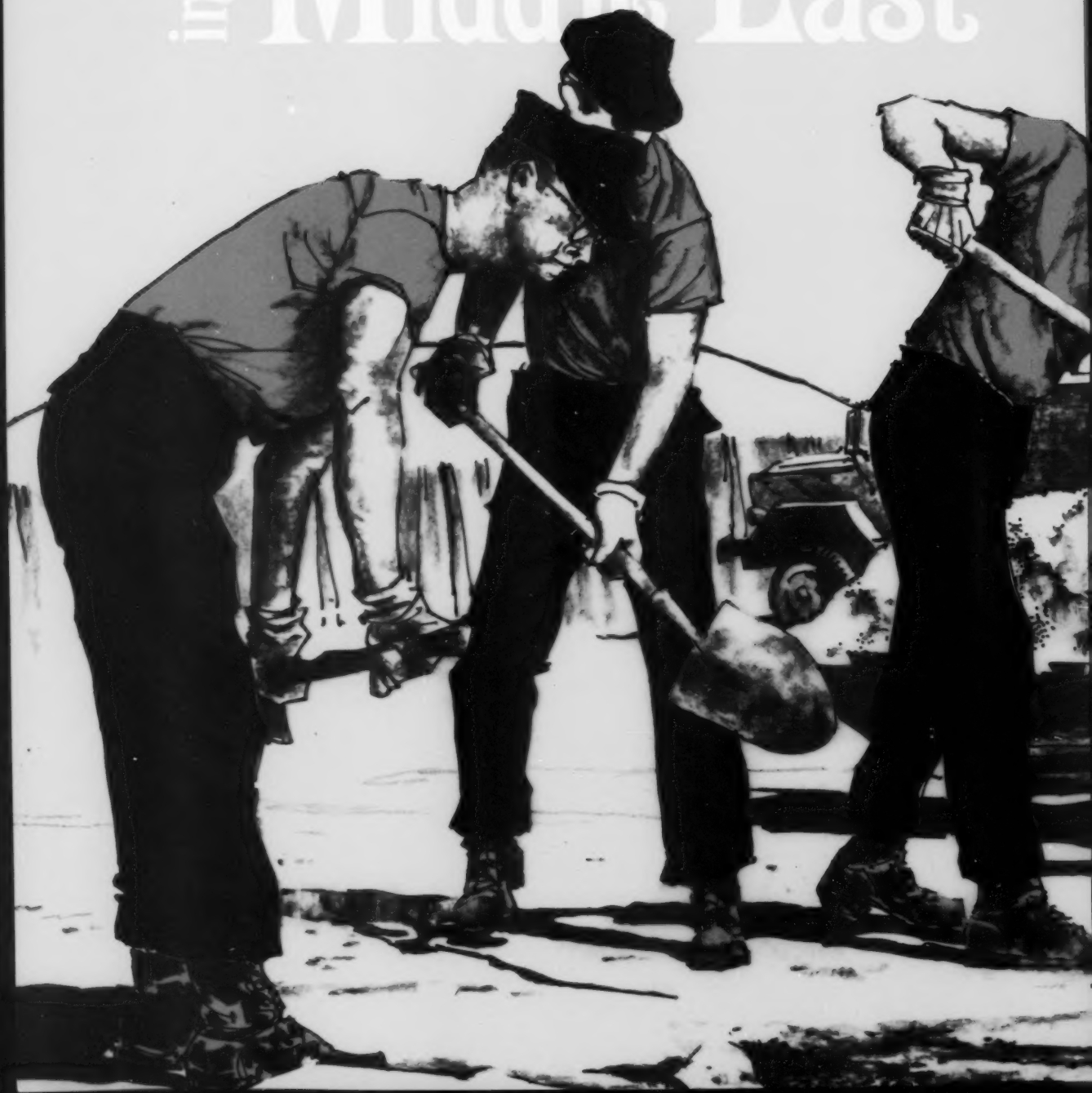
✔ Finally, and most importantly, the pride in knowing that you are helping preserve the freedom of your country as you grow in your profession

Here's what you can do...

If you are a young engineer or architect, please call a Reserve representative listed below.

LCDR Scott Cleveland, CEC, USN
Atlantic Region, RNCF
Naval Base, Building NH47
Charleston, SC 29408
Phone: (803) 743-2650
1-800-535-7936
AV 563-2650

LCDR Doug Stauffer, CEC, USN
Pacific Region, RNCF
Naval Training Center, Building 304
San Diego, CA 92133-1000
Phone: (619) 532-2142
AV 522-2142

Or, contact an active duty EFD Accessions Officer listed on the inside front cover for further information and details.

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